Troubleshooting Bendix® ESP® Stability System

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DIAGNOSTIC MODES

In order to communicate with the ECU, the controller has several modes that the technician can select, allowing information to be retrieved, or other ECU functions to be accessed.

To enter the various diagnostic modes:

No. of Times to Press the Blink Code Switch	System Mode Entered
1	Active diagnostic trouble code retrieval
2	Inactive diagnostic trouble code retrieval
3	Clear active diagnostic trouble codes
4	System configuration check
5	Dynamometer Test Mode
7*	Reconfigure ECU (See SD sheet for details.)

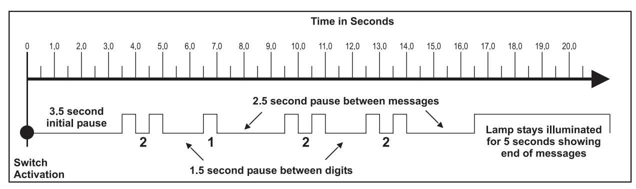
* To enter the Reconfiguration Mode, the switch must be held in before the application of ignition power. Once the power is supplied, the switch is released and then pressed seven times.

Active Diagnostic Trouble Code Mode

For troubleshooting, typically the Active and Inactive Diagnostic Trouble Retrieval Modes are used. The technician presses the blink code switch once and the ABS indicator lamp flashes a first group of two codes, and if there are more trouble codes recorded, this is followed by a second set of codes, etc. (See this page for a brief directory of these codes.)

Clearing Diagnostic Trouble Codes

To clear active diagnostic trouble codes (as problems are fixed), simply clear (or "self-heal") by removing and re-applying ignition power. The only exception is for wheel speed sensor trouble codes, which clear when power is removed, re-applied, and the ECU detects valid wheel speed from all wheel speed sensors. Alternately, codes may be cleared by pressing the diagnostic blink code switch 3 times (to enter the Clear Active Diagnostic Trouble Code Mode) or by using a hand-held or PC-based diagnostic tool. Hand-held or PC-based diagnostic tools are able to clear wheel speed sensor trouble codes without the vehicle being driven.



EXAMPLE OF BLINK CODE MESSAGE

Inactive Diagnostic Trouble Code Mode

The ECU stores past trouble codes and comments (such as configuration changes) in its memory. This record is commonly referred to as "event history." When an active trouble code is cleared, the ECU stores it in the event history memory as an inactive trouble code.

Using blink codes, the technician may review all inactive trouble codes stored on the ECU. The ABS indicator lamp will display inactive diagnostic blink codes when the diagnostic blink code switch is depressed and released two times.

Inactive trouble codes, and event history, may be retrieved and cleared by using a hand-held or PC-based diagnostic tool, such as the Bendix® ACom™ Diagnostics software.

Clearing Active Diagnostic Trouble Codes

The ECU will clear active trouble codes when the diagnostic blink code switch is depressed and released three times.

Visit www.bendix.com or www.foundationbrakes.com for Service Data Sheets and other literature such as the following:

BW1114 Quick Reference Catalog
BW1231 Tractor & Truck Air Brake System Troubleshooting Wallchart
BW1396 Tractor & Truck Air Brake System Troubleshooting
BW1555 Brake Balance Procedure
BW2780 Troubleshooting Bendix® ESP® Stability System Wallchart version of this piece
BW5057 Air Brake Handbook
SD-13-4869 Service Data Sheet for EC-60™ ABS/ATC Advanced Controllers

Bendix Blink Code to Description and Other Electronic Messaging Standards

(J1587 SID, J1939 SPN & FMI)

Bendix Blink Code 1st digit	Bendix Blink Code 2nd digit	DTC Description	J1587 SID	J1939 SPN	FMI
1	1	No DTCs	N/A	N/A	-
		Wheel Speed Sensor DTCs			
2	1	SA Left WSS Excessive Air Gap	1	789	1
3	1	SA Right WSS Excessive Air Gap	2	790	1
4	1	DA Left WSS Excessive Air Gap	3	791	1
5	1	DA Right WSS Excessive Air Gap	4	792	1
14	1	AA Left WSS Excessive Air Gap	5	793	1
15	1	AA Right WSS Excessive Air Gap	6	794	1
2	2	SA Left WSS Output Low @ Drive-Off	1	789	14
3	2	SA Right WSS Output Low @ Drive-Off	2	790	14
4	2	DA Left WSS Output Low @ Drive-Off	3	791	14
5	2	DA Right WSS Output Low @ Drive-Off	4	792	14
14	2	AA Left WSS Output Low @ Drive-Off	5	793	14
15	2	AA Right WSS Output Low @ Drive-Off	6	794	14
2	3	SA Left WSS Open or Shorted	1	789	2
3	3	SA Right WSS Open or Shorted	2	790	2
4	3	DA Left WSS Open or Shorted	3	791	2
5	3	DA Right WSS Open or Shorted	4	792	2
14	3	AA Left WSS Open or Shorted	5	793	2
15	3	AA Right WSS Open or Shorted	6	794	2
2	4	SA Left WSS Loss of Sensor Signal	1	789	10
3	4	SA Right WSS Loss of Sensor Signal	2	790	10
4	4	DA Left WSS Loss of Sensor Signal	3	791	10
5	4	DA Right WSS Loss of Sensor Signal	4	792	10
14	4	AA Left WSS Loss of Sensor Signal	5	793	10
15	4	AA Right WSS Loss of Sensor Signal	6	794	10
2	5	SA Left WSS Wheel End	1	789	7
3	5	SA Right WSS Wheel End	2	790	7
4	5	DA Left WSS Wheel End	3	791	7
5	5	DA Right WSS Wheel End	4	792	7
14	5	AA Left WSS Wheel End	5	793	7
15	5	AA Right WSS Wheel End	6	794	7
2	6	SA Left WSS Erratic Sensor Signal	1	789	8
3	6	SA Right WSS Erratic Sensor Signal	2	790	8
4	6	DA Left WSS Erratic Sensor Signal	3	791	8
5	6	DA Right WSS Erratic Sensor Signal	4	792	8
14	6	AA Left WSS Erratic Sensor Signal	5	793	8
15	6	AA Right WSS Erratic Sensor Signal	6	794	8
2	7	SA Left WSS Tire Size Calibration	1	789	13
3	7	SA Right WSS Tire Size Calibration	2	790	13
4	7	DA Left WSS Tire Size Calibration	3	791	13
5	7	DA Right WSS Tire Size Calibration	4	792	13
14	7	AA Left WSS Tire Size Calibration	5	793	13
15	7	AA Right WSS Tire Size Calibration	6	794	13
2	8	SA Left Poor Brake Performance	82	3534	7
3	8	SA Right Poor Brake Performance	83	3535	7
4	8	DA Left Poor Brake Performance	84	3536	7
5	8	DA Right Poor Brake Performance	85	3537	7
14	8	AA Left Poor Brake Performance	86	3538	7
15	8	AA Right Poor Brake Performance	87	3539	7
14	10	AA Left WSS Configuration Error	5	793	13
15	10	AA Right WSS Configuration Error	6	794	13
		Power Supply DTCs			
6	1	Battery Voltage Too Low	251	627	4
6	2	Battery Voltage Too High	251	627	3
6	3	Battery Voltage Too Low During ABS	251	627	4
6	4	Battery Voltage Input Open Circuit	251	627	5
6	5	Ignition Voltage Too Low	251	627	4
6	6	Ignition Voltage Too High	251	627	3
6	7	Ignition Voltage Too Low During ABS	251	627	4
6	8	Input Voltage Excessive Noise (Temp.)	251	627	2
6	9	Input Voltage Excessive Noise (Latched)	251	627	14
		Pressure Modulator Valve DTCs			
7	1	SA Left PMV REL Solenoid Shorted to Ground	48	795	4
8	1	SA Right PMV REL Solenoid Shorted to Ground	49	796	4
9	1	DA Left PMV REL Solenoid Shorted to Ground	50	797	4
10	1	DA Right PMV REL Solenoid Shorted to Ground	51	798	4
16	1	AA Left PMV REL Solenoid Shorted to Ground	52	799	4
17	1	AA Right PMV REL Solenoid Shorted to Ground	53	800	4
20	1	Trailer PMV REL Solenoid Shorted to Ground	66	1056	4
7	2	SA Left PMV REL Solenoid Shorted to Voltage	48	795	3
8	2	SA Right PMV REL Solenoid Shorted to Voltage	49	796	3
9	2	DA Left PMV REL Solenoid Shorted to Voltage	50	797	3
10	2	DA Right PMV REL Solenoid Shorted to Voltage	51	798	3
16	2	AA Left PMV REL Solenoid Shorted to Voltage	52	799	3
17	2	AA Right PMV REL Solenoid Shorted to Voltage	53	800	3
20	2	Trailer PMV REL Solenoid Shorted to Voltage	66	1056	3
7	3	SA Left PMV REL Solenoid Open Circuit	48	795	5
8	3	SA Right PMV REL Solenoid Open Circuit	49	796	5
9	3	DA Left PMV REL Solenoid Open Circuit	50	797	5
10	3	DA Right PMV REL Solenoid Open Circuit	51	798	5
16	3	AA Left PMV REL Solenoid Open Circuit	52	799	5
17	3	AA Right PMV REL Solenoid Open Circuit	53	800	5
20	3	Trailer PMV REL Solenoid Open Circuit	66	1056	5
7	4	SA Left PMV HLD Solenoid Shorted to Ground	42	795	4
8	4	SA Right PMV HLD Solenoid Shorted to Ground	43	796	4
9	4	DA Left PMV HLD Solenoid Shorted to Ground	44	797	4
10	4	DA Right PMV HLD Solenoid Shorted to Ground	45	798	4
16	4	AA Left PMV HLD Solenoid Shorted to Ground	46	799	4
17	4	AA Right PMV HLD Solenoid Shorted to Ground	47	800	4
20	4	Trailer PMV HLD Solenoid Shorted to Ground	66	1056	4
7	5	SA Left PMV HLD Solenoid Shorted to Voltage	42	795	3
8	5	SA Right PMV HLD Solenoid Shorted to Voltage	43	796	3
9	5	DA Left PMV HLD Solenoid Shorted to Voltage	44	797	3
10	5	DA Right PMV HLD Solenoid Shorted to Voltage	45	798	3
16	5	AA Left PMV HLD Solenoid Shorted to Voltage	46	799	3
17	5	AA Right PMV HLD Solenoid Shorted to Voltage	47	800	3
20	5	Trailer PMV HLD Solenoid Shorted to Voltage	66	1056	3
7	6	SA Left PMV HLD Solenoid Open Circuit	42	795	5
8	6	SA Right PMV HLD Solenoid Open Circuit	43	796	5
9	6	DA Left PMV HLD Solenoid Open Circuit	44	797	5
10	6	DA Right PMV HLD Solenoid Open Circuit	45	798	5
16	6	AA Left PMV HLD Solenoid Open Circuit	46	799	5
17	6	AA Right PMV HLD Solenoid Open Circuit	47	800	5
20	6	Trailer PMV HLD Solenoid Open Circuit	66	1056	5
7	7	SA Left PMV CMN Open Circuit	7	795	5
8	7	SA Right PMV CMN Open Circuit	8	796	5
9	7	DA Left PMV CMN Open Circuit	9	797	5
10	7	DA Right PMV CMN Open Circuit	10	798	5
16	7	AA Left PMV CMN Open Circuit	11	799	5
17	7	AA Right PMV CMN Open Circuit	12	800	5
20	7	Trailer PMV CMN Open Circuit	66	1056	5
7	8	SA Left PMV Configuration Error	7	795	13
8	8	SA Right PMV Configuration Error	8	796	13
9	8	DA Left PMV Configuration Error	9	797	13
10	8	DA Right PMV Configuration Error	10	798	13
16	8	AA Left PMV Configuration Error	11	799	13
17	8	AA Right PMV Configuration Error	12	800	13
20	8	Trailer PMV Chuff Test/Configuration Error	66	1056	7
		J1939 DTCs			
11	1	J1939 Serial Link	231	639	12
11	2	J1939 Retarder	231	639	14
11	3	J1939 Engine Communications	231	639	2
11	4	J1939 Invalid Data (Engine/Retarder)	231	639	2
11	5	J1939 Supply Pressure	231	639	2
11	6	J1939 ESP Messages Invalid Data	231	639	2
		Miscellaneous DTCs			
11	7	Time-Out or Invalid Data on ETC7/VP15 (for HSA-Function)	231	639	2
11	12	J1939 HSA Switch Error or Unavailable	231	639	2
12	1	Stop Lamp Switch Not Detected	55	1045	7
12	2	Stop Lamp Switch Always On	231	639	2
12	3	Dynamometer Test Mode	17	576	14
12	4	Retarder Relay or HSA Lamp Open Circuit or Shorted to Ground	13	801	2
12	5	Retarder Relay Circuit or HSA Lamp Shorted to Voltage	13	801	3
12	6	ABS Dash Indicator Circuit DTC	23	811	2
12	7	PMV Common Shorted to Ground	93	802	4
12	8	PMV Common Shorted to Voltage	93	802	3
12	9	ATC Disabled to Prevent Brake Fade	17	614	14
12	10	Tire Size Out of Range (Front to Rear)	79	1069	13
12	11	Wheel Speed Sensors Reversed on an Axle	22	810	7
12	12	Diff Lock Solenoid Shorted to Ground or Open Circuit	102	564	5
12	13	Diff Lock Solenoid Shorted to Voltage	102	564	3
12	14	Sensor CAN Supply Voltage Error	103	1808	2
12	15-21	Reserved	N/A	N/A	N/A
12	22	ESP Sensor Voltage Out of Range	103	1808	2
12	23	I/O2 or I/O3 Shorted High	154	614	3
12	24	HSA Solenoid Shorted to Voltage	94	2622	3
12	25	HSA Solenoid Open or Shorted to Ground	94	2622	5
		ECU DTCs			
13	1	ECU (02)	254	629	12
13	2	ECU (10)	254	629	12
13	3	ECU (11)	254	629	12
13	4	ECU (12)	254	629	2
13	5	ECU (13)	254	629	2
13	6	ECU (14)	254	629	12
13	7	ECU (15)	254	629	2
13	8	ECU (16)	254	630	13
13	9	ECU (17)	254	630	13
13	10	ECU (18)	254	630	12
13	11	ECU (1A)	254	802	12
13	12	ECU (1B)	254	802	12
13	13	ECU (80)	254	629	12
13	14	ECU (04)	254	629	12
13	15	ECU (06)	254	629	12
13	16	ECU (0E)	254	629	12
13	17	ECU (0D)	254	629	2
13	18	ECU (19)	254	629	2
13	19	ECU (1C)	253	630	12
13	20	ECU (27)	253	630	12
13	21	ECU (1D)	253	630	13
13	22	ECU (1E)	253	630	13
13	23	ECU (28)	253	630	13
13	24	ECU (37)	254	629	12
13	25	VIN / Chassis Mis-Match	254	629	12
		TCV DTCs			
18	1	TCV DA Solenoid Shorted to Ground	18	806	4
18	2	TCV DA Solenoid Shorted to Voltage	18	806	3
18	3	TCV DA Solenoid Open Circuit	18	806	5
18	4	TCV DA Configuration Error	18	806	13
19	1	TCV SA Solenoid Shorted to Ground	19	807	4
19	2	TCV SA Solenoid Shorted to Voltage	19	807	3
19	3	TCV SA Solenoid Open Circuit	19	807	5
19	4	TCV SA Configuration Error	19	807	13
		Steering Angle Sensor DTCs			
21	1	SAS Not Calibrated	89	1807	13
21	2	SAS Calibration in Progress	89	1807	13
21	3	SAS Static Signal	89	1807	2
21	4	SAS Signal Out of Range	89	1807	2
21	5	SAS Signal Reversed	89	1807	2
21	6	SAS Invalid Signal	89	1807	12
21	7	SAS Gradient Error	89	1807	2
21	8	SAS CAN Timeout	89	1807	9
21	9	SAS Long Term Calibration Error	89	1807	2
21	10	SAS Plausibility Check (Ref Yaw Rate)	89	1807	2
		Yaw Rate Sensor DTCs			
22	1	YRS Signal Out of Range	103	1808	2
22	2	YRS Sensor Reversed Signal	103	1808	2
22	3	YRS Invalid Signal	103	1808	2
22	4	YRS Gradient Error	103	1808	2
22	5	YRS CAN Timeout	103	1808	9
22	6	YRS Static BITE Error	103	1808	2
22	7	YRS Dynamic BITE Error	103	1808	2
22	8	YRS Fast Calibration Error	103	1808	2
22	9	YRS Static Calibration Error	103	1808	2
22	10	YRS Normal Calibration Error	103	1808	2
22	11	YRS Sensitivity Calibration Error	103	1808	2
22	12	YRS Plausibility Check (Ref Yaw Rate)	103	1808	2
22	13	YRS Plausibility Error (Inside Model Based Limits)	103	1808	2
22	14	YRS Plausibility Error (Outside Model Based Limits)	103	1808	2
22	15	YRS Sign Check Not Completed	89	1808	13
22	16	YRS Vibration Detected	103	1808	2
		Lateral Acceleration Sensor DTCs			
23	1	LAS Signal Out of Range	99	1809	2
23	2	LAS Calibration in Progress	99	1809	13
23	3	LAS Static Calibration Error	99	1809	2
23	4	LAS Long Term Calibration Error	99	1809	2
23	5	LAS Plausibility Error (Inside Model Based Limits)	99	1809	2
23	6	LAS Plausibility Error (Outside Model Based Limits)	99	1809	2
23	7	Erratic ESP Sensor Signal	99	1809	14
		Pressure Sensor DTCs			
24	1	PS1 Open or Shorted	77	1067	2
24	2	PS2 Open or Shorted	78	1068	2
24	3	PS3 Open or Shorted	69	1059	2
24	4	PS1/PS2 Plausibility Error	77	1067	11
24	5	PS Supply Voltage Error	77	1067	2
24	6	PS Not Calibrated	77	1067	7

See the Service Data sheet for full test and repair procedures:

SD-13-4869 Bendix® EC-60™ Advanced ABS Controllers

Troubleshooting Bendix® ESP® Stability System

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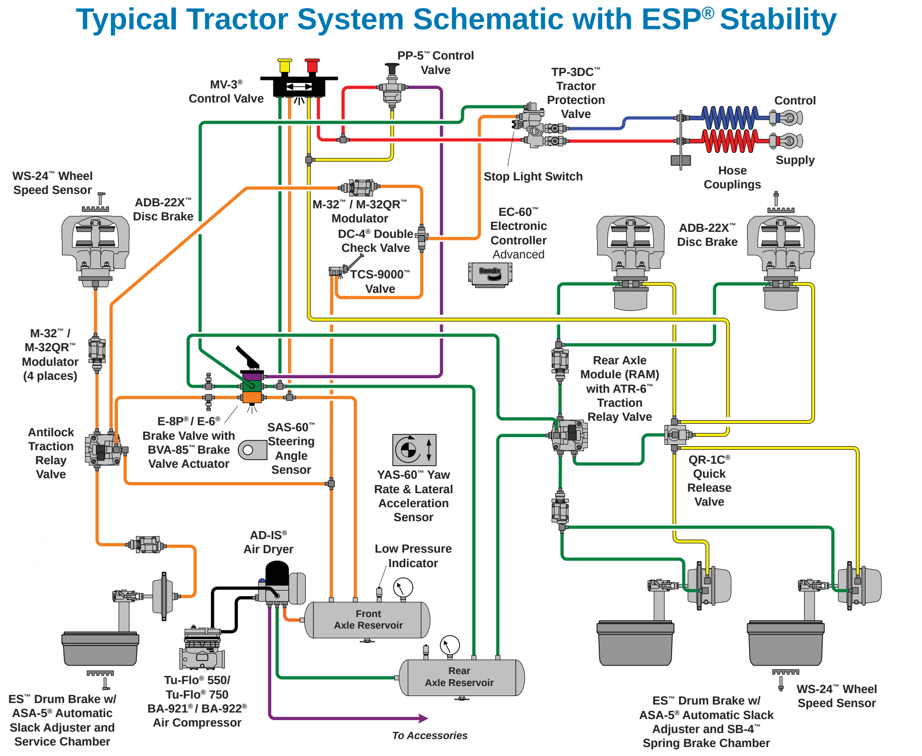
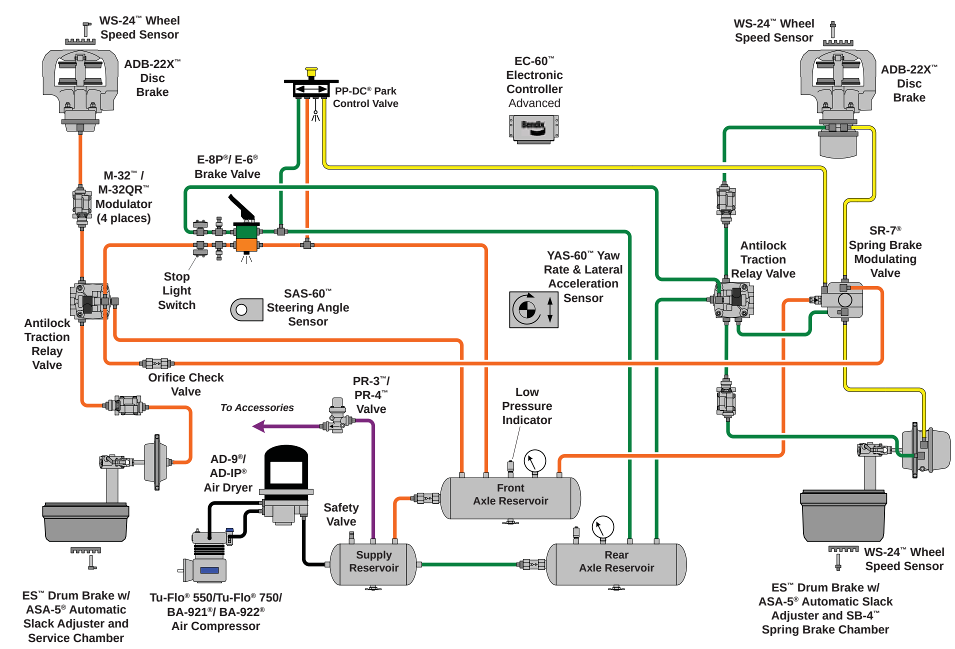
Typical Tractor System Schematic with ESP® Stability



Typical Truck System Schematic with ESP® Stability



Notes:
The color coding of the brake system schematic follows TMC Recommended Practice #423.
Air disc & drum brake actuation combined on a single axle are shown for pictorial purposes only.

TRUCKS AND TRUCK TRACTORS:

Charging | Primary | Secondary | Park (Supply) | Parking (Control) | Accessories

Troubleshooting: PC-based Troubleshooting, Blink Codes and Diagnostic Tools & Modes

The information presented here is condensed from the troubleshooting section of the Bendix® EC-60™ Advanced ABS Controller Service Data Sheet, SD-13-4869 available for download on www.bendix.com. Whenever possible, use a PC-based diagnostic tool, such as the Bendix® ACom™ Software (free download from www.bendix.com) or hand-held Bendix® Remote Diagnostic Unit (RDU). The Bendix® ACom™ Software uses on-screen troubleshooting steps to help correct any DTCs. The Bendix® ACom™ Software (BW2329) may also be ordered on CD from the Literature Center at www.bendix.com.

Below: *Bendix® Remote Diagnostic Unit (RDU),* ***Right:*** *Bendix® ACom™ Diagnostics Software for ABS*

ECU DIAGNOSTICS

The EC-60™ controller contains self-testing diagnostic circuitry that continuously checks for the normal operation of internal components and circuitry, as well as external ABS components and wiring.

Active Diagnostic Trouble Codes (DTCs)

When an erroneous system condition is detected, the EC-60™ controller:

1. Illuminates the appropriate indicator lamp(s) and disengages part or all of the ABS, ATC and ESP functions. (See Service Data Sheet.)
2. Places the appropriate trouble code information in the ECU memory.
3. Communicates the appropriate trouble code information over the serial communications diagnostic link as required. Hand-held or PC-based diagnostic tools attach to the vehicle diagnostic connector, typically located on or under the dash.

When using our PC-based Bendix® ACom™ Software, follow the on-screen troubleshooting steps to correct any DTCs. A hand-held tool such as the Bendix Remote Diagnostic Unit (RDU) provides direct access to the DTCs without the need to use blink codes.

BLINK CODES

Blink codes allow a technician to troubleshoot ABS problems in situations where a hand-held or PC-based diagnostic tool is not available. Instead, information about the ABS system is communicated by the ECU, using the ABS indicator lamp to display sequences of blinks.

Note: The ECU will not enter the diagnostic blink code mode if the wheel speed sensors show that the vehicle is in motion. If the ECU is in the diagnostic blink code mode and then detects vehicle motion, it will exit the blink code mode.

In addition, by operating the blink code switch as described below, one of several diagnostic modes can be entered. See Diagnostic Modes section below.

Blink Code Switch Activation

When activating the blink code switch:

1. Wait at least two seconds after "ignition on." (Except when entering Reconfiguration Mode - see Service Data sheet.)
2. For the ECU to recognize that the switch is activated "on," the technician must press for at least 0.1 seconds, but less than 5 seconds. (If the switch is held for more than 5 seconds, the ECU will register a malfunctioning switch.)
3. Pauses between pressing the switch when a sequence is required, (e.g. when changing mode) must not be longer than 2 seconds.
4. After a pause of 3.5 seconds, the ECU will begin responding with output information blinks.

Blink Code Timing

The ECU responds with a sequence of blink codes. The overall blink code response from the ECU is called a "message." Each message includes, depending on the mode selected by the technician, a sequence of one or more groups of blinks. Simply record the number of blinks for each sequence and then use the brief troubleshooting index shown here, or full troubleshooting information in the Service Data sheet, for active or inactive trouble codes.

NOTE:

1. Sequences of blinks illuminate the ABS indicator lamp for half a second, with half-second pauses between them.
2. Pauses between blink code digits are 1.5 seconds.
3. Pauses between blink code messages are 2.5 seconds.
4. The lamp remains on for 5 seconds at the end of the messages.

Once the ABS indicator lamp begins displaying a sequence of codes, it continues until all blink code messages have been displayed and then returns to the normal operating mode. During this time, the ECU will ignore any additional blink code switch activation.

All trouble codes, with the exception of voltage and J1939 trouble codes, will remain in an active state for the remainder of the power cycle.

Voltage trouble codes will clear automatically when the voltage returns within the required limits. All ABS functions will be re-engaged.

J1939 trouble codes will clear automatically when communications are re-established.

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